REMARKS/ARGUMENTS

Claims 12 and 14-19 are pending in this application.

Claim 12 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Higgins, III (U.S. 5,583,377) in view of Suzuki (U.S. 6,028,358). Claim 14 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Higgins, III in view of Suzuki, and further in view of Li (U.S. 5,982,621). Claims 15-19 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Higgins, III in view of Suzuki, and further in view of Li. Applicants respectfully traverse the rejections of claims 12 and 14-19.

> Claim 12 recites:
> "A process for fabricating an integrated circuit package, comprising:
>
> **providing a substrate having opposing first and second surfaces and conductive traces extending therebetween, the substrate having a cavity therein;**
>
> **fixing a heat slug in the form of a substantially flat plate to said first surface of said substrate, such that said heat slug spans said cavity;**
>
> mounting a semiconductor die to said heat slug, at least a portion of said semiconductor die being disposed in said cavity;
>
> wire bonding said semiconductor die to ones of said conductive traces at said second surface of said substrate;
>
> encapsulating said wire bonds and said semiconductor die in an encapsulating material; and
>
> forming a ball grid array on said first surface of said substrate such that bumps of said ball grid array are in electrical connection with ones of said conductive traces." (emphasis added)

The Examiner alleged that Higgins, III teaches all of the features recited in Applicants' claim 12, except for a heat slug in the form of a substantially flat plate. The Examiner, further alleged that Suzuki teaches a heat slug in the form of a flat plate that spans an open cavity. Thus, the Examiner concluded that it would have been obvious to fix the heat slug in the form of a substantially flat plate as allegedly taught by Suzuki in the package taught by Higgins, III. The Examiner alleged that a substantially flat heat slug is "an alternative and art-recognized equivalent for substitution." Applicants respectfully disagree.

In the Response to Arguments section on pages 4 and 5 of the outstanding Office Action, the Examiner responded to Applicants' argument regarding Higgins, III not teaching a substantially flat plate by stating that "many benefits are achieved if the base portion is planar with the circuitized substrate (col. 6, lines 60-68, lines 7-68; col. 8, lines 49-51 [of the Higgins, III]."

As acknowledged by the Examiner in the last sentence on page 2 of the outstanding Office Action, Higgins, III fails to teach or suggest that the heat slug in the form of a substantially flat plate. However, as noted above, in the Response to Arguments section, the Examiner appears to be alleging that Higgins, III suggests that the heat sink may be in the form of a flat plate, and refers to col. 6, lines 60-68, lines 7-68 and col. 8, lines 49-51 of Higgins, III. Applicants respectfully disagree with the Examiner's allegations because Higgins, III clearly teaches away from the use of a heat sink in the form of a substantially flat plate as recited in Applicants' claim 12.

Referring particularly to col. 6, lines 12-17 of Higgins, III, Higgins, III discloses that "[c]ommon features of each heat sink include a base portion, sidewalls, and flanges. In particular, heat sinks 80, 90 and 100 have base portions 82, 92 and 102, respectively, sidewalls 84, 94 and 104, respectively, and flanges 86, 96 and 106, respectively". Thus, Higgins clearly teaches that each of the heat sinks must include a base portion, **sidewalls and flange portions**. Not only does Higgins, III fail to teach or suggest a heat sink in the form of a substantially flat plate, but in fact, Higgins, III teaches away from the use of a heat sink in the form of a substantially flat plate because Higgins, III teaches that the heat sink must includes a base portion, **sidewalls and flanges**.

Referring to col. 6, lines 57-67 of Higgins, III (referred to by the Examiner), Higgins, III discloses that "In a preferred embodiment, the base portion thickness should be such that the top surface or active surface of the semiconductor die is planar with the circutized substrate to achieve the smallest possible device profile. The die can also be made planar with the substrate by adjusting the height of the sidewalls of the heat sink. The base portion also preferably extends below circuitized substrate to facilitate thermal coupling to a user's substrate. However, many benefits of the present invention are achieved if the base portion is planar with the circuitized substrate".

The Examiner is clearly referring to **only** the base portion of the heat sink of Higgins, III when alleging that many benefits of the present invention are achieved "if the base portion is planar with the circuitized substrate," and is completely ignoring sidewalls and the flanges of the heat sink of Higgins, III. Higgins, III in no way teaches or suggests that the other portions of the heat sink, namely the sidewalls and the flanges, are not or could not be present in disclosing that "many benefits of the present invention are achieved if the base portion is planar with the circuitized substrate". In fact, as indicated above, Higgins, III teaches that common features of the heat sink taught by Higgins, III are a base portion, **sidewalls and flanges**. Thus, Higgins, III is referring only to the base portion of the heat sink when indicating that there are benefits to having a base portion planar with the circuitized substrate, and is clearly not teaching or suggesting that the necessary sidewalls and flanges could or should be omitted when the base portion is arranged to be planar with the circuitized substrate.

The portions of the specification of Higgins, III that the Examiner relies upon to allegedly provide support for a heat sink in the form of a substantially flat plate refer to a heat sink that is **not** just a flat plate, but rather to a heat sink that includes a base portion, **sidewalls and flanges**. This portion referred to by the Examiner, only describes **a base portion** that is planar with the substrate or that is in the same plane as the substrate. There is absolutely no teaching or suggestion in Higgins, III of the heat sink being in the form of a substantially flat plate as recited in Applicants' claim 12. Instead, Higgins clearly teaches away from a heat sink in the form of a substantially flat plate, as recited in Applicants' claim 12.

The Examiner is reminded that it is error to find obviousness where references diverge and teach away from the invention at hand. W.L. Gore & Assoc. v. Garlock Inc., 220 USPQ 303, 311 (Fed. Cir. 1983).

In referring to the Suzuki reference, Suzuki completely fails to teach or suggest fixing a heat slug in the form of a substantially flat plate to a first surface of a substrate such that the heat slug spans a cavity of the substrate. Instead, Suzuki teaches the use of a metallic base substrate 4, which the Examiner has incorrectly alleged corresponds to a heat slug.

Applicants' claim 12 clearly requires both of the steps of providing a substrate having opposing first and second surfaces and conductive traces extending therebetween, the substrate having a cavity therein and fixing a heat slug in the form of a substantially flat plate to said first surface of said substrate such that said heat slug spans said cavity.

The metallic base substrate 4 of Suzuki cannot possibly be fairly construed as the heat slug recited in Applicants' claim 12 because Suzuki clearly teaches that this is a substrate, rather than a heat slug being attached to a substrate. The only cavities in the metallic base substrate of Suzuki are cavities through which the continuity checking terminals extend (see Fig. 1B of Suzuki). There is clearly **no** cavity in the base substrate 4 taught by Suzuki in which at least a portion of the semiconductor die is mounted, as recited in Applicants' claim 12.

The metallic base substrate of Suzuki is clearly **not** equivalent to the heat slug as recited in Applicants' claim 12. Suzuki clearly does not refer to a heat slug, but instead refers only to a metallic base substrate on which layers are laminated, including an insulation layer in the metallic film layer. The insulation layer and the metallic film layer are clearly not equivalent to the substrate recited in Applicants' claim 12 since these layers are laminated to a substrate, rather than provided as a substrate having opposing first and second surfaces and conductive traces extending therebetween, the substrate having a cavity therein, as recited in Applicants' claim 12. Thus, the metallic base substrate taught by Suzuki certainly cannot be fairly construed as the heat slug recited in Applicants' claim 12.

Accordingly, neither Higgins, III nor Suzuki teaches or suggests the features of "providing a substrate having opposing first and second surfaces and conductive traces extending therebetween, the substrate having a cavity therein" and "fixing a heat slug in the form of a substantially flat plate to said first surface of said substrate, such that said heat slug spans said cavity" as recited in Applicants' claim 12.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection of claim 12 under 35 U.S.C. § 103(a) as being unpatentable over Higgins, III in view of Suzuki.

The Examiner relied upon Li to allegedly cure deficiencies of Higgins, III and Suzuki. However, Li clearly fails to teach or suggest the features of "providing a substrate having opposing first and second surfaces and conductive traces extending therebetween, the substrate having a cavity therein" and "fixing a heat slug in the form of a substantially flat plate to said first surface of said substrate, such that said heat slug spans said cavity" as recited in Applicants' claim 12. Therefore, Applicants respectfully submit that Li fails to cure the deficiencies of Higgins, III and Suzuki described above.

Accordingly, Applicants respectfully submit that Higgins, III, Suzuki and Li, applied alone or in combination, fail to teach or suggest the unique combination of method steps and features recited in Applicants' claim 12.

In view of the foregoing remarks, Applicants respectfully submit that claim 12 is allowable. Claims 14-19 depend upon claim 12, and are therefore allowable for at least the reasons that claim 12 is allowable.

In view of the foregoing amendments and remarks, Applicants respectfully submit that this application is in condition for allowance. Favorable consideration and prompt allowance are solicited.

The Commissioner is authorized to charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-1353.

Respectfully submitted,

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